

- [SITE UTC](#)
- [Newsletter](#)
- [Twitter](#)
- [Facebook](#)
- [Web TV](#)
- [EN](#)
  - [FR](#)
- [Search in interactions.utc.fr](#)

Name of the website

Menu

Menu complémentaire

Focusing

[on meaningful innovation](#)

- [Themes](#)
  - [Bio-mechanical and Bio-engineering sciences](#)
  - [Biology, Bio-chemistry and Bio-technologies](#)
  - [Process engineering; Chemistry; Sustainable development](#)
  - [Mechanical and Materials sciences & engineering; acoustics](#)
  - [ICTs: computer sciences; Automation & Control; Decision theory and applications](#)
  - [Technology, Social Sciences and Humanities](#)
  - [Multi-scale urban system modelling](#)
  - [Applied mathematics](#)
  - [Industrial Design](#)
  - [Pluridisciplinarity](#)
  - [Doctorate](#)
  - [Entrepreneurship](#)
  - [Prizes and Competitions](#)
  - [International](#)
  - [Campus life, art and culture](#)
  - [You have the floor](#)

- [Magazine](#)

1. [Home](#)
2. [Themes](#)
3. [ICTs: computer sciences; Automation & Control; Decision theory and applications](#)
4. [Interaction between Real and Virtual Worlds](#)
5. A front-line, cutting-edge laboratory for digital sciences

[ICTs: computer sciences; Automation & Control; Decision theory and applications](#)

Files

## Interaction between Real and Virtual Worlds

Virtual reality (VR) technology associated for a long time solely with video games, has since experienced a major boom, particularly in the field of training. The «democratisation» of VR headsets is no stranger to this. The number of headsets sold has exploded from 5 million units in 2014 to 68 million in 2020, their cost has dropped and the technology itself has evolved. We are now talking about immersive technologies including virtual, augmented and mixed realities (VR/AR/MR). UTC has been a pioneer since it introduced, as early as 2001, teaching in virtual reality and launched, within its Heudiasyc laboratory, research on both the fundamental and application levels. The interaction between the real and virtual worlds opens up immense

fields of application, particularly in relation to robotics. For example, we can interact with a drone that maps the damage caused by a natural disaster in places that have become inaccessible. Obviously, these new possibilities can be used for malicious purposes, and this raises several ethical issues. UTC's academics are aware of this.

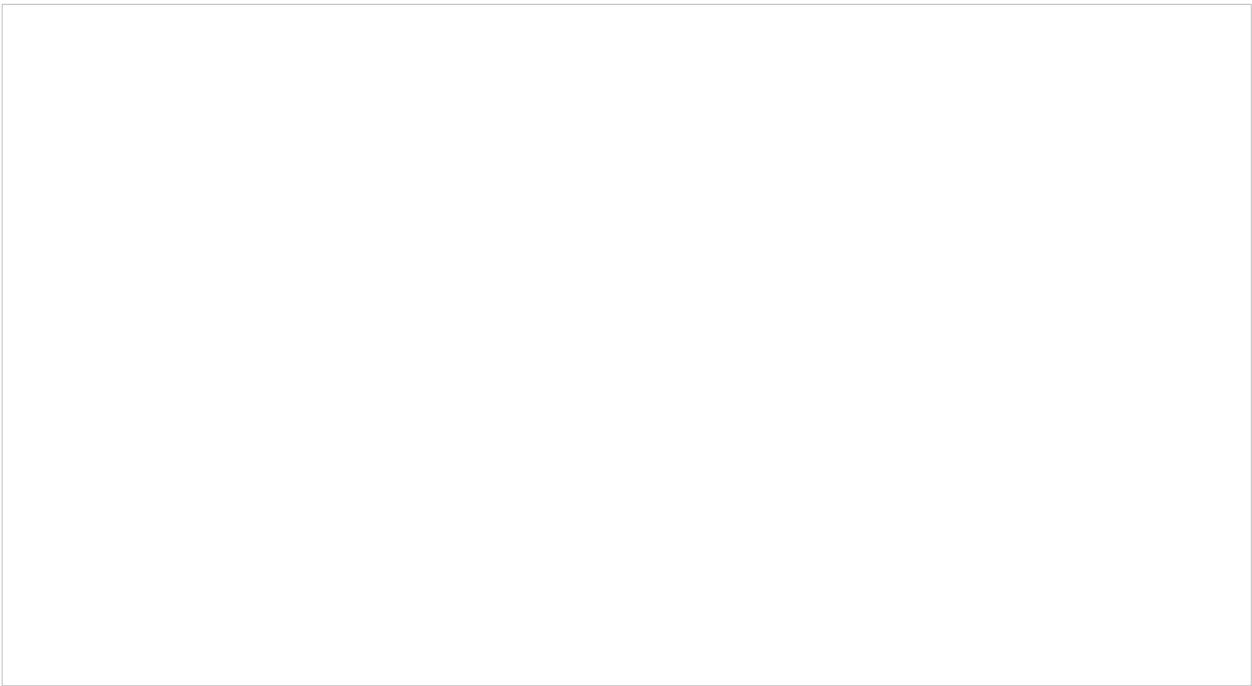
21 Jun 2021

Interaction between Real and Virtual Worlds

## Summary

- [A front-line, cutting-edge laboratory for digital sciences](#)
- [The rapid growth of VR \(virtual reality\) and AR \(augmented reality\) research](#)
- [From real to virtual drones](#)
- [Kiva - training in gestural expertise](#)
- [Scenery adaptation in VR \(Virtual Reality\)](#)

**A front-line, cutting-edge laboratory for digital sciences**



**Professor Philippe Bonnifait, has been director of the UTC-Heudiasyc Laboratory, created in 1981, since January 2018. A cutting-edge laboratory dedicated to digital sciences, which specialises in scientific methods related to artificial intelligence, robotics, data analysis, automation and virtual reality.**

**Created in 1981 and associated with the CNRS since its foundation, the UTC Heudiasyc Laboratory (Heuristics and Diagnosis of Complex Systems) is attached to the INS2I (Institute of Information Sciences and their Interactions), one of the ten CNRS national institutes and initially headed by Prof. Ali Charara, former director.**

Can we single out a particularity of UTC Heudiasyc ? "It is a laboratory that brings together research scientists in computer science and computer engineering, two specialities that are often addressed separately; we are one of the first laboratories to have this vision in France," explains Philippe Bonnifait.

As the world of computer science is, by nature, evolving, the themes addressed by the laboratory's lecturer cum research scientists have themselves naturally evolved and quite considerably so.. The proof ? The development of research in the field of virtual reality. "A development that coincided with the arrival of Indira Thouvenin in 1995 at the UTC, a personality who is very well known in her field. The projects led by Indira were in strong interaction with cognition, human and social sciences, and involved numerous collaborations with other laboratories, notably UTC-Costech," emphasises Prof. Bonnifait.

Since the restructuring of the laboratory in January 2018 and the down-sizing from four to three teams - CID (Knowledge, Uncertainty, Data), SCOP (Safety, Communication, Optimisation) and SyRI (Interacting Robotic Systems) - various interdisciplinary themes have been identified. This is the case of VR (virtual reality), an eminently cross-disciplinary subject, which thus 'straddles' the SyRI and CID teams. "WithinCID, we are interested in adaptive systems and the personalisation of systems; themes where we find a number of elements linked to immersive environments, one of Domitile Lourdeaux's research fields. At SyRI, where Indira Thouvenin is based, we are particularly interested in robotics, with subjects such as robot autonomy-smart, autonomous vehicles and drones for our part -, control, perception and data fusion, and interacting multi-robot systems,' explains Philippe Bonnifait. In short? "In the case of multirobots, there are three types of interaction: those with their environment, those with other robots and finally those with humans. In my opinion, it is very important to put the human being back at the centre of all the projects we develop. If we take the concrete case of the windscreen of the future, for example, a project by Indira, it is a question of creating mixed reality on the windscreen, head-up displays, an application intended for the autonomous vehicle in the

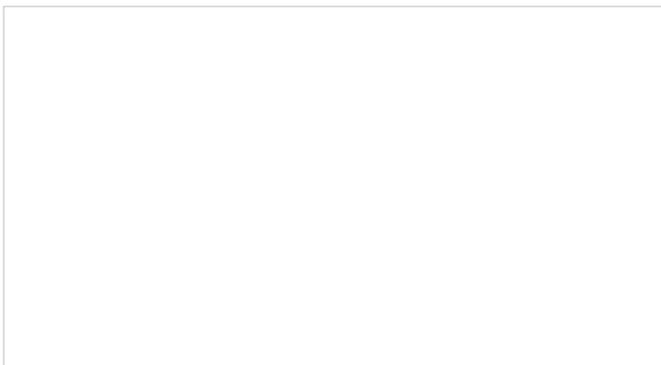
long term," he explains.

These interactions are evolving as we talk more and more about symbiotic autonomous systems. "We are moving towards the symbiosis of intelligent machines with humans in a large number of areas. One example? The Xenex robot, an American invention, which has been deployed in a number of hospitals for disinfecting rooms using UV light. This is very useful, especially in these times of Covid," he says.

While in this case we are dealing with a truly autonomous machine, this is not the case in all sectors. "Let's take drones. They always need a remote pilot, and what we are trying to do at Heudiasyc is to have a remote pilot for several drones; a remote pilot who can take control in the event of a problem, because a drone in a crowd, for example, can cause a lot of damage. This is also the case for the autonomous vehicle, which, even in the long term, will need the vigilance of the driver. However, there is a middle way open to us: moving towards this human-machine symbiosis so that we can imagine new ways to drive," adds Philippe Bonnifait.

The interaction between the real and virtual worlds opens up huge fields of application. For the better - the drone that monitors the state of drought in certain areas - and for the worse- certain military applications. This poses eminently ethical problems. "For a long time, ethics remained rather remote from our concerns, but the technological developments of the last ten years, with dangerous or even lethal uses, have put ethics back at the centre of the reflections on AI (artificial intelligence).

## Read also on the same subject



### [The rapid growth of VR \(virtual reality\) and AR \(augmented reality\) research](#)

[From real to virtual drones](#)



### [From real to virtual drones](#)

[PDF](#)

[Share](#)

- [Facebook](#)
- [Twitter](#)

- [Linkedin](#)

[Reading](#)  
[comfortPrint Français](#)

## Magazine

The magazine is available in French and English

Jun 2021 • n° 55

### L'interaction entre le monde réel et le monde virtuel

- [Download in french - PDF - 25031 Ko](#)
- [Download in english - PDF - 24979 Ko](#)

(Couverture) Interactions - Jun 2021 • n° 55

[Other magazines](#)

## Subscribe to UTC interactions newsletters

## Donnons un sens à l'innovation

Construite sur une pédagogie de l'autonomie et une recherche technologique interdisciplinaire orientée vers l'innovation, l'UTC forme des ingénieurs, masters et docteurs aptes à appréhender les interactions de la technologie avec l'homme et la société.

Avec ses 9 laboratoires de recherche et son ouverture internationale, l'UTC se positionne parmi les meilleures écoles d'ingénieurs dans le monde.

- [WEB-TV UTC](#)
- [Graduate](#)
- [Donation](#)
- [Contact the writing staff](#)
- [Credits](#)
- [Legal mention](#)
- [Cookies](#)